

4. Abstract Overview

Abstract: This coastal watershed restoration project is located in the Stony Brook watershed in the town of Brewster on Cape Cod, Massachusetts (**Figure 1**). The project includes several components: 1) two separate salt marsh restoration sites to restore a total of 41 acres of salt marsh; 2) two separate fish passage improvement projects to restore diadromous fish passage to 386 acres of spawning and nursery habitat for endangered river herring and American eels; 3) removal of a beach parking lot suffering from coastal erosion and restoration of the barrier beach; and 4) remediation of stormwater discharges throughout the watershed in order to improve water quality for shellfish, fish and wildlife. Restoration work involved feasibility assessments, planning, fundraising, permitting, construction, monitoring, and outreach. The town and its partners have also preserved hundreds of acres of open space in the watershed over the years, which will help to ensure the long-term viability of restoration. This comprehensive watershed approach utilizing restoration, improvement of water quality and protection of open space, provides an ideal model for restoration and protection of our coastal heritage. Brewster's success is due to strong long-term partnerships forged between local, regional, state, and federal agencies, non-profit organizations, and citizens who share a strong environmental ethic.

Goals and objectives: Restoration goals were to restore impaired salt marsh by restoring tidal flow, improve 3,500 feet of fish passage to 386 acres of pond habitat for diadromous fish, reduce the spread of invasive *Phragmites*, and improve water quality and habitat for shellfish, fish, wildlife, and four rare species. Objectives were to: **(1)** Restore 20 acres of salt marsh on Stony Brook by replacing an undersized 4'-diameter tidal culvert under a state highway with an 18'-wide box culvert which will also improve 3,000 feet of diadromous fish passage; **(2)** Restore 21 acres of salt marsh at Freeman's Pond, a tributary to Stony Brook, by replacing an undersized culvert with a 10' box culvert; **(3)** Improve a fish ladder as part of a dam reconstruction project that will maintain safe water levels in the 386 acres of headwater ponds that provide fish spawning habitat; **(4)** Remediate stormwater discharges in five areas of the watershed; **(5)** Complete construction within an aggressive timeframe; **(6)** Monitor salt marsh, fish run, water quality, *Phragmites*, and rare species to ensure that restoration goals are met; and **(7)** Provide outreach by constructing a marsh observation platform, installing trail signage, hosting outreach events, and training volunteer monitors.

Partners: This project epitomizes the goal of the Coastal America Partnerships Program, which is to protect, preserve and restore the nation's coastal resources and ecosystems and to increase public awareness regarding coastal issues. Many partners were needed for funding, technical expertise and project management of this large-scale, multi-component project with a total budget of approximately \$2.382 million (not counting matches). A Project Team consisting of staff from NOAA Restoration Center, MA DER, Brewster Natural Resources, APCC and the Massachusetts Bays Program provided project management, partnership coordination, and obtained the resources necessary to plan, design, permit and construct this project. Partners with technical expertise ensured that the project was successful. Legislators and citizens supported the project at every stage. Funding was provided by the American Recovery and Reinvestment Act of 2009, NOAA, the Gulf of Maine Council, MA CZM, MA DER, the Cape Cod Conservation District, and the Eddy Foundation of Brewster.

5. Project Need and Resource Benefits / Outputs

Background: The Stony Brook watershed in Brewster contains some of Cape Cod's most important coastal resources. These include the Stony Brook herring run, one of the most popular herring runs in the state; many acres of salt marsh, freshwater and tidal wetlands; shellfish, fish and wildlife habitat; rare species; hundreds of acres of open space; and beautiful coastal vistas.

The Stony Brook run enables migrating river herring (e.g., alewife and blueback herring) and American eels to reach 386 acres of spawning and juvenile habitat in five ponds totaling 386 acres in area. These diadromous fish have been declining regionally and protection and restoration of their habitat is a high priority. Healthy salt marshes are also critically important resources due to their high habitat value for fish, shellfish and wildlife. Salt marshes are also important for controlling storm surges and flooding and building resilience against sea level rise. However, healthy salt marshes require large amounts of tidal flow.

Need: In 1996, MA CZM determined that the Stony Brook salt marsh south of Route 6A was starved for sea water because the two culverts beneath the highway were too narrow to allow sufficient tidal flow to reach the marsh. Tidal restriction had damaged salt marsh habitat by enabling conversion to freshwater wetlands and encroachment by invasive *Phragmites*. Undersized culverts also hampered fish passage for river herring and American eels. The Brewster Alewife Committee was concerned that the aging culverts could potentially block the herring run. Other watershed concerns included untreated or poorly treated stormwater discharges into Stony Brook and its estuary, important shellfish growing areas. A Project Team consisting of staff from NOAA Restoration Center, MA DER, Brewster DNR, APCC and the Mass Bays Program organized to plan and carry out restoration. Strong support from citizens and partners enabled this restoration project to progress from feasibility studies in 2005 to completion of construction in 2010-2013. Funding was primarily from NOAA through an American Recovery and Reinvestment Act of 2009 grant, assisted by other grants.

Restoration activities: The project consists of:

- 1) Restoration of 20 acres of salt marsh on Stony Brook was accomplished by replacing a 3'- culvert under the highway with an 18' box culvert to increase tidal flow. Culvert enlargement will also improve 3,000 feet of diadromous fish passage since migratory fish prefer to migrate along open streams rather than narrow dark culverts. On upstream property owned by the Cape Cod Museum of Natural History, gaps were opened in a trail crossing the marsh to increase tidal flow in the marsh, an observation platform was built, and interpretive signage installed. This project was completed in Fall 2010. Post-restoration monitoring will be conducted through the end of 2013.
- 2) Restoration of 21 acres of salt marsh on Freeman's Pond near the mouth of Stony Brook involves replacing an undersized culvert with a 10'-wide box culvert to increase tidal flow. A paved parking lot on the beach which was suffering from repeated coastal erosion was removed in 2011 in order to restore the barrier beach. This restoration project is undergoing regulatory permitting now and will be completed in 2012.
- 3) Improvement of the fish ladder to Lower Mill Pond will be conducted over the next two years as part of a dam reconstruction project that will maintain safe water levels in five headwater ponds totaling 386 acres. The dam and water control structure are failing and

need to be replaced. The fish ladder will improve approximately 100' of migratory fish passage into this first of five spawning ponds. This project will be completed in 2013.

- 4) Remediation of stormwater discharges in the watershed involved assessment and prioritization of discharges; development of engineering plans; and construction. Stony Brook Road improvements were completed in 2010. The discharge at the mouth of Stony Brook on Cape Cod Bay and at the intersection of the state highway and Stony Brook will be remediated by the end of 2011. Discharges from other sections of Stony Brook Road north and south of the state highway will be addressed by the end of 2012.

Monitoring: At Stony Brook salt marsh, monitoring targets include salt marsh vegetation, salinity, river herring counts, stream water quality, water level, water temperature, flow rate, coverage by *Phragmites*, and location and coverage by two rare plant species. Pre-restoration monitoring was conducted from 2007 to Fall 2010, followed by construction in Fall 2010. Post-restoration monitoring is now being conducted and will continue through 2013. A post-restoration tidal study will be conducted in 2011 to evaluate how the pre-restoration tidal model performed in predicting restored flows.

Benefits / Outputs: Long-term ecological and socioeconomic benefits include: **(1)** Restoration of 41 acres of salt marsh at Stony Brook and Freeman's Pond; **(2)** Improvement of 3,100 linear feet of stream habitat and diadromous fish run to 386 acres of spawning habitat in five ponds; **(3)** Reduction of invasive *Phragmites australis*; **(4)** Improved habitat and water quality for coastal species including alewife (*Alosa pseudoharengus*), blueback herring (*A. aestivalis*), American eels (*Anguilla rostrata*), *Spartina alterniflora*, *S. patens*, other salt marsh plants, threatened species, and coastal birds, fish, wildlife and shellfish; **(5)** Improved resilience against storm surges, flooding and sea level rise; **(6)** Improved coastal access; **(7)** Creation and retention of jobs in the region; and **(8)** Sustainable fishing, shellfishing and coastal tourism.

Education and Outreach: Educational benefits include construction of a salt marsh viewing platform, interpretive signage, and an ADA-accessible trail on neighboring Cape Cod Museum of Natural History property; engagement of citizen volunteers to monitor the herring run and salt marsh; and engagement of business leaders. Other events included public meetings and an event held to mark the completion of the Stony Brook culvert project.

Conservation Goals: The following goals are met: **(1)** *Protects, restores and promotes stewardship of coastal and marine habitat to support our nation's fisheries for future generations, and to create healthy and sustainable habitat that provides a range of benefits for abundant fish and wildlife, commercial and recreational opportunities, and resilient coastal communities that can withstand hurricanes, flooding and other threats* (NOAA Fisheries Office of Habitat Conservation); **(2)** *Restore and protect the Commonwealth's rivers, wetlands and watersheds for the benefit of people and the environment* (MA DER); **(3)** *Restore and protect coastal ecosystems and coastal heritage of Cape Cod Bay and Massachusetts Bay* (Mass Bays Program); **(4)** *Protect and enhance Cape Cod's natural resources and quality of life* (APCC); **(5)** *Promote watershed protection and fish and wildlife habitat, including improving water quality for shellfish beds, restoring degraded salt marshes and restoring anadromous fish passages* (NRCS, Cape Cod Water Resources Restoration Project); and **(6)** *Restore and protect shellfish, fish, wetlands, water and wildlife habitat* (Town of Brewster).

6. Partnership Functioning – Funding & Other Support: Project Team Leaders are indicated in bold font. Funding from federal, state and private sources totaled \$2,382,042 not counting matches and funding for preserving open space.

- **NOAA Restoration Center: project management, financial support (\$58,600 for feasibility study with Gulf of Maine Council and \$1,647,600 in ARRA funding for construction), technical and in-kind support;**
- **Town of Brewster Department of Natural Resources: Project Team leader, project management, technical and in-kind support, construction and contracting oversight, community coordination. The Town is a landowner;**
- **MA Division of Ecological Restoration, MA Department of Fish & Game (DFG): Project management, \$ grant for tidal study; technical and in-kind support, grant-writing, permitting review, monitoring assistance;**
- **Association to Preserve Cape Cod and Massachusetts Bays Program, Cape Cod Region: Project management, technical and in-kind support, grant-writing, monitoring, rare species permitting, outreach;**
- Brewster Town Manager and Board of Selectmen: project management, technical and in-kind support and coordination;
- Brewster Alewife Committee: identified restoration needs, monitoring, outreach;
- Brewster Department of Public Works: stormwater engineering, technical assistance, coordination, oversight of stormwater construction projects;
- USDA NRCS: ARRA funding (\$186,750) for construction of Freeman's Pond salt marsh restoration projects, Cape Cod Water Resources Restoration Project;
- Gulf of Maine Council for the Marine Environment: \$58,600 grant for feasibility study (with NOAA);
- MA CZM, former Wetlands Restoration Program: technical, financial, and in-kind support, including funding a preliminary tidal study;
- MA CZM, Coastal Pollutant Remediation program: grants for watershed stormwater assessment (2007, \$19,150) and design and permitting (2011, \$20,142);
- Massachusetts Bays Program, MA CZM: technical and in-kind support;
- MA Division of Marine Fisheries, DFG: technical guidance;
- Woods Hole Group, Inc. and MA Corporate Wetlands Restoration Program: in-kind donation for tidal study (\$15,000);
- MA Riverways Program, DFG: training for herring counts;
- MA Department of Environmental Protection: 319 grant for stormwater BMP construction (\$346,800), and a 604(b) ARRA grant for engineering plans (\$58,000);
- MA Department of Transportation: owner of state highway, permitting;
- Barnstable County Coastal Resources Committee: supported grant-writing;
- Cape Cod Museum of Natural History: landowner, developed outreach signage, input to observation platform design;
- Eddy Foundation of Brewster: grants for monitoring (\$20,000);
- Compact of Cape Cod Conservation Trusts: assisted in open space preservation;
- Brewster Conservation Trust: preserved open space in the watershed;
- State and federal legislators: support for grant applications and ARRA funding.